WHAT IS CLAIMED IS:

1. A Method of Monitoring and Controlling Calcium ion behavior characteristics within a cooling tower system, the process comprising the steps of:

collecting a sample of makeup water and cooling tower water, in sequence, of a known volume, at a timed and/or continuous frequency;

performing a titration test for the naturally occurring calcium ion within both the makeup and cooling tower water;

performing a titration test for the naturally occurring chloride ion and/or an electronic measurement of the naturally occurring conductivity within the makeup water and cooling tower water; and

performing a series of calculations to establish a measurement of the calcium ion behavior characteristics within the cooling tower system's water;

2. The process according to claim **1**, including responding to the behavior characteristics of the calcium ion within the cooling tower water by increasing or decreasing the chemical treatment dosing; and increasing or decreasing the bleed off rate from the cooling tower system.

3. The method according to claim **1**, including collecting a known volume of water sample of the makeup water and cooling tower water, in sequence, at a timed and/or a continuous frequency.

4. The method according to claim **3**, including performing a series of liquid titration tests upon the water sample of the makeup water and cooling tower water, in sequence, at a timed and/or continuous frequency, and measuring the calcium ion and the chloride ion concentration within each sample.

Claim 5. A Method of Determining Calcium Ion Concentration In A Cooling Tower comprising: determining the naturally occurring calcium ion and chloride/conductivity concentration within said cooling tower's makeup water;

determining the calcium ion and chloride/conductivity within the cooling tower's recirculating water;

calculating the minimum targeted calcium ion within the cooling tower recirculating water based upon the concentration of the naturally occurring calcium ion and chloride/conductivity within the makeup water and recirculating water;

calculating the percentage of calcium ion concentration; and

comparing the percentage of calcium ion concentration to the calculated targeted calcium ion within the cooling tower water, whereby if the actual calcium ion within the cooling tower recirculating water is below the calculated minimum calcium ion, then scaling tendencies have been identified; and if the actual calcium ion within the cooling tower water be lOO -150% of the calculated minimum calcium ion, then a positive tendency is occurring, and if the actual calcium ion within the cooling tower water is above about 150% of the minimum calcium ion, then calcium ion is being scavenged from the cooling tower system, resulting in a hyperactive tendency.

Claim 6. A method according to claim 5 including, based upon monitoring the behavior of the calcium ion within the cooling tower water, carrying out and administering a cooling water scale and corrosion treatment within said cooling tower water to maintain the calcium ion at or slightly above (100- 150%) the calculated minimum calcium ion.

Claim 7. A method according to claim 5 including maintaining the administration of the cooling water scale and corrosion treatment, based upon the behavior of the calcium ion content, an efficient application of the treatment.

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9. The method according to claim 4, including measuring the calcium ion and chloride ion and/or conductivity concentration, and calculating the cycles of concentration according to Formula 1.

10. The method according to claim 9, including calculating the theoretical concentration of the minimum calcium ion within the cooling tower water according to the following Formula 2: ppm chloride ion tower water/ ppm chloride ion makeup water = cycles of concentration chlorides) or conductivity uS conductivity tower water / uS conductivity makeup water = cycles of concentration conductivity).

11. The method according to claim 10, including calculating the theoretical concentration of the minimum calcium ion within the cooling tower water according to Formula 2.

12. The method according to claim 6, comprising measuring and comparing the actual calcium ion concentration within the cooling tower water to the calculated theoretical minimum calcium ion concentration within the cooling tower water based upon the following Formula 3:

ppm calcium ions tower water / ppm calcium ions theoretical min. = % of the calcium ions theoretical min.

13. The method according to claim 7, including determining the behavior of the calcium ion within the cooling tower water, based upon one or more of the following formulae;

Precipitating Behavior = calcium ions tower water less than 100% of calcium ions theoretical min.

Positive Behavior = calcium ions tower water 100% - 150% of calcium ions theoretical min.

Hyperactive Behavior = calcium ions tower water greater than 150% of calcium ions theoretical min.

14. The method according to claim 8, including responding to the behavior of the calcium ion as follows;

Precipitating Behavior - Increase/Decrease Chemical Treatment and/or Bleed Off Rate;

Positive Behavior - Increase/Decrease Chemical Treatment and/or Bleed Off Rate; and Hyperactive Behavior - Increase/Decrease Chemical Treatment and/or Bleed Off Rate.

15. The method according to claim 9, including storing and relaying the data and response to a separate computer for observation, display and trending.

16. Apparatus for Monitoring and Controlling Calcium ion behavior within a cooling tower system, comprising:

means for collecting a sample of makeup water and cooling tower water, in sequence, of a known volume, at a timed and/or continuous frequency;

means for performing a titration test for the naturally occurring calcium ion within both the makeup and cooling tower water;

means for performing a titration test for the naturally occurring chloride ion and/or an electronic measurement of the naturally occurring conductivity within the makeup water and cooling tower water; and

means for performing a series of calculations to establish a measurement of the calcium ion behavior characteristics within the cooling tower system's water;

17. The apparatus according to claim 16, including means for responding to the behavior characteristics of the calcium ion within the cooling tower water including means for increasing or decreasing the chemical treatment dosing; and means for increasing or decreasing the bleed off rate from the cooling tower system.

18. The apparatus according to claim 17, including means for collecting a known volume of water sample of the makeup water and cooling tower water, in sequence, at a timed and/or a continuous frequency.

19. The apparatus according to claim 18, including means for performing a series of liquid titration tests upon the water sample of the makeup water and cooling tower water, in sequence, at a timed and/or continuous frequency, and;
means for measuring the calcium ion and the chloride ion concentration within each sample.

20. The apparatus according to claim 17 including means for measuring the electronic conductivity of the makeup water and cooling tower water.